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REQUEST FOR A STANDARD PATENT

AND NOTICE OF ENTITLEMENT

The Applicant identified below requests the grant of a patent to the nominated person identified below for an invention described in the accompanying standard complete patent specification.

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[54]Invention Title: "MULTISC CULTIVE SYSTEM"

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Applicant states the following:

1. The nominated person is the actual inventor.

2. The nominated person is the applicant of the associated provisional application.

DATED: 25 November, 1992

JOHN CHARLES EVANS
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MOLLUSC CULTURE SYSTEM

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A culture system for use in cultivating molluscs comprising a flexible tube capable of being gathered at a plurality of locations along its length, for retaining the molluscs in respective batches along the length. The system includes support means associated with each location for supporting a respective batch of molluscs. The system further includes retaining means associated with each support means for locating a respective batch of molluscs relative to the flexible tube and means for maintaining the tube expanded at least in the vicinity of the batches.

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COMPLETE SPECIFICATION
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Complete Specification for the invention entitled:

"HOLLOW CORTICAL STENT"

Our Ref: 218497

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

MOLLUSC CULTURE SYSTEM

The present invention relates generally to mollusc culture systems, and in particular to mollusc culture system used in an aqueous environment. The invention is applicable to culture systems for use in cultivating shellfish, such as scallops, in a salt-water or marine environment, and it will be convenient to hereinafter describe the invention in relation to that exemplary application, although it should be appreciated that the apparatus is not limited to that application.

In order to encourage their growth, young molluscs such as scallops are usually placed in a marine environment, such as provided by scallop breeding farms which are often located in sheltered ocean or coastal waters.

In order to obtain improved growing conditions, the depth at which the young molluscs are located is often controlled. It is known that enclosures made from netting may be provided in which young molluscs may be placed. These enclosures, or cages, are often supported by ropes between floats near their upper extremity, and anchoring devices or weights near their lower extremity in order to maintain the enclosures at a predetermined depth below the surface.

These cages are usually provided with a support member on which the young molluscs are manually placed. The cages are often provided with a surrounding netting which protects the young molluscs from predators and ocean conditions which may be likely to dislocate them from the support member.

Several enclosures are often secured together in a series by ropes or tapes in order that a greater number of enclosures and hence molluscs may be lowered into and subsequently removed from the marine environment whilst minimizing the number of mechanical actions performed.

It is also known to grow molluscs in hanging culture cages known as "lantern nets". Such cages often comprise a cylinder of netting material which is supported in a

marine environment so that its longitudinal axis is vertical, and which has floors located at various intervals along the cylinder to thereby form a number of compartments into which the young molluscs may be manually placed. Openings are often provided in the netting material for the molluscs to be placed in each compartment. Once the molluscs have been placed into each compartment, each opening is manually laced to protect against predators and other disturbances likely to dislocate the molluscs.

As will be appreciated by those skilled in the field, such methods of mollusc cultivation are labour intensive. It is a time consuming task to place the molluscs in each compartment and subsequently to lace the openings through which they were placed. When the caps are removed, it is also time consuming to unlace or cut each of the compartment openings and remove the molluscs. In addition handling and transportation of the molluscs in an unpacked or individual state creates delays and increases costs.

It is an object of the present invention to provide a mollusc culture system which minimises or alleviates one or more of the problems of known methods or apparatus for the cultivation of molluscs.

With that object in mind, the present invention provides a culture system which is suitable at least for marine cultivation of molluscs. The molluscs are confined within a flexible tube. This tube is able to be bunched at positions along its length so that gathered between these positions are batches of molluscs, the tube therefore comprising a series of molluscs batches. At each bunched position, the tube may be tied, clamped or otherwise retained so that it remains bunched in a temporary or permanent arrangement.

The culture system comprises a plurality of adjacent support means or members. Each support member has associated therewith tube retaining means. The mollusc batches may be locatable in the culture system by securing the tube to said retaining means at the positions of

bunching. In this way, each of the mollusc batches may be supported by a support member and the tube may be supported or maintained in an expanded state between two adjacent support members.

In one embodiment of the present invention, means may be provided so that the tube is expanded at locations along the length of the tube. Such means may comprise a ring inside the tube. The ring may be of any suitable material, such as plastic or plastic coated wire, and may be welded or otherwise secured to the tube.

A series of rings may be welded to the tube so that when the tube is bunched together and located in the retaining means of each support member the rings may cause the tube to remain expanded adjacent to each location that has been bunched. In this way, the tube may be held in an expanded position adjacent the facing surface of each support member in order to increase the number of molluscs in each batch which can be supported by each support member without the material of the tube disturbing them

This invention is described herein with reference to the system in a normal use orientation under water with the force of buoyancy in the vertical direction, and terms such as "up" and "down" should be construed in the light of this orientation. However, it is to be appreciated that other orientations may be equally possible and that consequential changes in terms such as those above may be required in the light of those other orientations for a proper and complete understanding of the invention.

In at least one embodiment, the tube may be porous to allow the free flow of water through the tube and in this way encourage growth of the molluscs. Any openings through which the water flows should naturally be sufficiently small so that the molluscs are retained within and not allowed to pass outside the tube. It may be however, that other applications of the invention require a non-porous tubing to be used, for example, if a largely suitable environment for the growth of the molluscs can be provided inside the tube.

The tube should be flexible enough so that it may be

bunched at positions along its length, to thereby form mollusc batches, in order that the tube may be properly secured by the retaining means.

In at least one embodiment, the tube may be formed from expansible netting material. The netting material preferably is capable of resisting destructive corrosion in the aqueous environment in which the molluscs are cultivated. Materials such as metal wire, cotton cord or polymeric plastics such as polyvinyl chloride, nylon and polyester may be used in the fabrication of the netting material, as will be appreciated by those skilled in the relevant art.

In addition to the other advantages provided in the mechanical operation of the culture system of the present invention such as ease of loading and unloading the series of mollusc batches, confinement of the molluscs within a tube provides advantages in handling and transportation of the molluscs which have been individually handled in prior art systems.

The culture system of the present invention may include a plurality of adjacent support members, each member being capable of supporting a batch of molluscs. The support members may be adjacent to one another in order that a series of mollusc batches as described previously may run from one support member to an adjacent support member, and from that member to an adjacent support member, and so on. In one embodiment of the invention, the support members may be conveniently aligned and parallel in a superposed relationship, but other orientations may be envisaged. The support members, for example, may be oriented in a side-by-side relationship.

In one embodiment of the invention, one or more support members may be flat and may be in the form of discs although any convenient shape which supports a batch of molluscs may be used including partially closed or walled containers. A variety of materials may be used in the construction of the support members, including plastics and other self-supporting materials. In one embodiment of the invention, the or each support member

may comprise plastics material and may be formed in the shape of a disc, with respective mollusc batches being supported by respective upper surfaces of the discs.

In another embodiment of the invention, a frame having a plurality of interconnecting frame elements may be used and flexible material such as woven fabric or netting material may be strung between the frame elements so as to support the batches of molluscs. The frame elements may include materials such as steel wire. This steel wire may be plastic coated or treated to resist corrosion. Netting material may be strung between the wire frame members and a mollusc batch supported thereon. Other suitable combinations of material may be used, as will be well appreciated by those skilled in the relevant art.

Each support member has associated therewith tube retaining means, so that each batch of molluscs may be securely held between two adjacent support members by their associated retaining means.

The support members generally have a surface which faces a mollusc batch when the mollusc batch is placed on the support member, and an opposing face. If the support member is a disc, the facing surface will be the surface supporting the batch of molluscs. If the support member is a walled container, the facing surface may be or include a surface of a side or other member of the container surrounding the batch of molluscs, but not directly supporting them.

In a further embodiment of the invention, the tube retaining means may comprise an opening in the support member communicating the facing surface and the opposing surface and running inwardly from an edge of the facing surface. The tube may be bunched and passed along the opening and retained therein by the relative narrowness of the opening with respect to the thickness of the tube material in the opening.

It is to be appreciated that other retaining means are possible, such as hooks or ties, for example, and that other methods may be used to locate or retain the tube

with respect to the support means.

In a further embodiment of the invention, the opening communicating the facing surface and the opposing surface may be obliquely angled with respect to the facing surface so as to assist location by the retaining means.

In a further embodiment of the invention, the support member may include a facing surface which is substantially horizontal such as the facing surface of a disc. Preferably the opening between the facing surface and the opposing surface is not perpendicular to the facing surface, but is at an oblique or sloping angle. The edges provided at the interface of the facing surface and the opening, and the opposing surface and the opening, may provide further resistance to movement of the tube through the opening.

In a further embodiment of the invention, the opening may comprise an enlarged portion. The tube may be partly or wholly retained by this enlarged portion. In this embodiment the tube may be touched and passed along the opening and partly or wholly located in the enlarged portion. The remainder of the opening therefore may be only temporarily open in order that the tube be passed along it to the enlarged portion.

In a further embodiment of the invention, the enlarged portion of the opening may have an oblique angle with respect to the facing surface of the supporting member in order to provide further resistance to movement of the tube through the enlarged portion of the opening.

The opening may comprise a slot through a support member, which may be a disc, running from an outer edge of the disc to an enlarged portion of the opening, which may be a hole of larger diameter than the width of the slot. Whilst in this embodiment the diameter of the hole should be large enough to partly or wholly retain the tube, the slot need only be such as to allow passage of the tube along it. The hole may be circular. It may further be generally perpendicular to the facing surface of the supporting member. The portions of the disc on either side of the slot may be flexible and/or resilient, so that

the disc may be temporarily deformed to allow passage of the tube along the opening to the enlarged portion.

In a further embodiment of the invention, the walls of the enlarged portion of the opening may have a different such as an oblique angle, with respect to the facing surface of the supporting member, than the remainder of the opening. When the tube has been bunched and passed along the opening and then located in the enlarged portion, the differing angles may assist in retaining the tube in the enlarged portion by making resistance to movement of the tube through the opening greater in the remainder of the opening than in the enlarged portion of the opening.

As will be appreciated, in order to provide this greater resistance, the hole need not be perpendicular to the facing surface, but may be at an oblique angle also. The remainder of the opening need only be at a greater oblique angle than the enlarged portion in this embodiment.

It will also be appreciated that other forms of increasing the resistance to movement may be used, such as irregularities in the shape and surface of the slot, the relative sizing of the slot and hole, and other techniques apparent to one skilled in the relevant art.

In a further embodiment of the present invention, the openings of the adjacent support members may be substantially aligned with respect to each other in order to more conveniently locate a series of mollusc batches in the culture system of the present invention. A first mollusc batch may be placed on one of the support members of the culture system. The tube may be bunched on one side of the mollusc batch and then secured to a retaining means associated with a adjacent support member. In a preferred embodiment of the invention, this may consist of the tube being passed along an opening in the support member. In a further preferred embodiment of the present invention, a plurality of such openings may be aligned in order that the tube may be bunched on either side of a mollusc batch and may be more conveniently passed along said opening.

In a further embodiment of the present invention, the support members of the culture system may be maintained in their adjacent relationship by ganging means. In one embodiment of the invention, the ganging means may comprise one or more elements to which each support means may be attached. The ganging means may comprise a plurality of elements such as ropes, tapes or wire.

The ganging means may be secured to each support member. In a further embodiment of the invention, each support member may be provided with openings within which to locate the elements of the ganging means. These openings may comprise slots or holes in the support members.

In a further embodiment of the invention, the ganging elements may be formed from the same material as the material surrounding the openings in order that mechanical welding may occur therebetween. However, other means may be used to secure the support members to the ganging elements in order to maintain their spaced relationship, as will be appreciated by one skilled in the relevant art.

In a further embodiment of the invention, the support members and ganging means may be encased in a protective material to protect the molluscs from predators. This material may be made of meshing or any other suitable material.

According to the present invention there is provided a culture system for use in cultivating molluscs, said system comprising:

a flexible tube capable of being gathered at least at a plurality of locations along its length, for retaining said molluscs in respective batches along said length;

support means associated with each location for supporting a respective said batch of molluscs;

retaining means associated with each support means for locating a respective said batch of molluscs relative to said flexible tube; and

means for maintaining said tube expanded at least in the vicinity of said batches.

For assistance in arriving at an understanding of the present invention, one example of a culture system incorporating the present invention is illustrated in the attached drawing. The preceding description of the apparatus may be read with reference to the drawing. However, as the drawing illustrates one preferred example only, their particularity is not to be understood as superceding the generality of the preceding description.

In the drawing:

Figure 1 is a side view of a prior art enclosure for cultivation of molluscs;

Figure 2 is a side view of another prior art enclosure for cultivation of molluscs; and

Figure 3 is a side view of one form of molluscs culture system according to the present invention.

Referring to Fig. 3, the culture system includes an expansible tube 30 of plastics netting material. Seed molluscs are charged into the tube 30 to form localized batches or masses 31, 32, 33 at spaced intervals. The spaced masses 31, 32, 33 are supported on respective disc members 34, 35, 36 with the tube 30 being gathered at respective locations adjacent each disc member to pass through relatively narrow openings in the respective disc members. Each disc member comprises molded plastics and includes a central opening 37 and a radial slot 38 as exemplified in disc member 35. The walls of central opening 37 are formed at substantially 90^{o} to the major surfaces of disc member 35 and receive the gathered portion of tube 30. The diameter of opening 37 may be varied to suit the grade of plastics netting material passing therethrough. The walls of radial slot 38 are formed at an oblique angle of about 45^{o} to the major surfaces of disc member 35. The obliquely formed walls of radial slot 38 retain the gathered portion of tube 30 inside central opening 37 of disc member 35 because the gathered portion orients normally to the major surfaces of disc member 35 due to the weight and mass of the molluscs

inside.

Disc members 34, 35, 36 are tied or ganged together by means of ganging elements in the form of ropes 39, 40, 41. The ropes are located in respective slots 42, 43, 44 formed in each disc member as exemplified in disc member 34. Respective slots 42, 43, 44 in each disc member 34, 35, 36 are substantially vertically aligned in use to receive ropes 39, 40, 41 therein. Ropes 39, 40, 41 are formed of a material compatible with disc members 33, 34, 35 to allow for mechanical welding.

An external predator mesh socking 45 is drawn over the disc members 34, 35, 36 and secured at the ends. The diameter of each disc 34, 35, 36 may be approximately 350mm and the distance between the discs may be approximately 150mm.

Finally, it should be appreciated that alterations, modifications and/or additions may be introduced into the constructions and arrangements of parts previously described without departing from the spirit or ambit of the present invention.

The claims defining the invention are as follows:-

1. A culture system for use in cultivating molluscs said system comprising:

a flexible tube capable of being gathered at a plurality of locations along its length, for retaining said molluscs in respective batches along said length;

support means associated with each location for supporting a respective said batch of molluscs;

retaining means associated with each support means for locating a respective said batch of molluscs relative to said flexible tube; and

means for maintaining said tube expanded at least in the vicinity of said batches.

2. A culture system according to claim 1 wherein said flexible tube is porous to allow flow of water therethrough.

3. A culture system according to claim 1 or 2 wherein said flexible tube comprises expansible netting material.

4. A culture system according to claim 1, 2 or 3 wherein said maintaining means is provided by each said support means.

5. A culture system according to any one of the preceding claims wherein each support means comprises a disc member having a support surface.

6. A culture system according to any one of claims 1 to 4 wherein each support means comprises a frame having a plurality of interconnecting elements and means strung between said elements for supporting the associated batch of molluscs.

7. A culture system according to any one of the preceding claims wherein said maintaining means comprises a ring associated with each location and secured to said flexible tube.

8. A culture system according to any one of the preceding claims wherein said retaining means comprises an opening in each said support means for receiving a gathered portion of said flexible tube.

9. A culture system according to claim 8 wherein each said opening includes an enlarged portion and a slot

extending from said enlarged portion to an edge of the associated support means.

10. A culture system according to claim 8 or 9 wherein at least a portion of the walls each said opening is at a different angle than the remainder of the opening.

11. A culture system according to any one of the preceding claims including ganging means secured to said support means.

12. A culture system substantially as herein described with reference to Figure 3 of the accompanying drawings.

DATED: 21 November, 1991.

JOHN CHARLES EVANS
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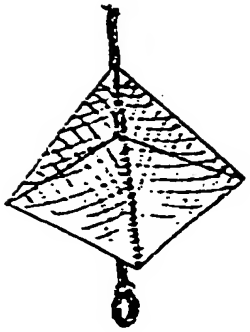

FIG 1
(PRIOR ART)

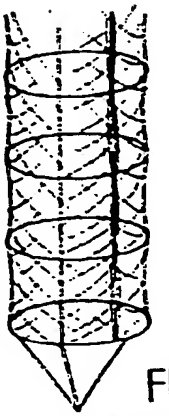

FIG 2
(PRIOR ART)

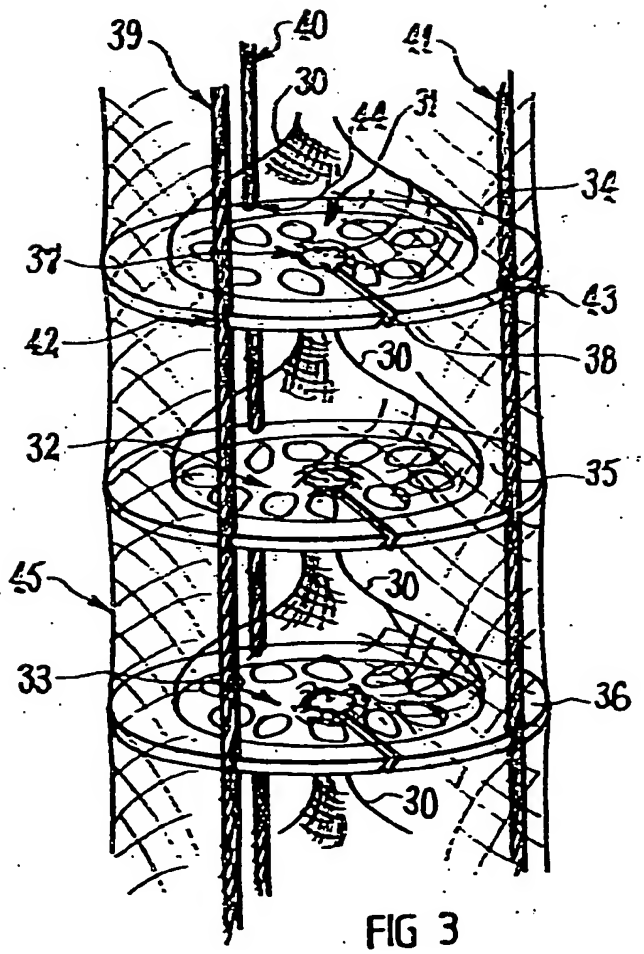

FIG 3